A Novel Procedure for Evaluating the Rotational Stiffness of Traditional Timber Joints in Taiwan

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ABSTRACT

Timber joint is one of the most important factors that affect the global behavior of timber structures in all over the world. This paper aims at proposing a new procedure for evaluating the rotational stiffness of timber joints found in Taiwan. Firstly, dismantled surveys were conducted on five historic timber structures; the results showed that three various types of timber joints can be found in beam-to-column timber joints, nondestructive testing method was proposed and applied on a total of 72 full-scale specimens to propose a method to classify the timber joints. The results showed that stress wave velocity and amplitude transmission ratios are feasible for distinguishing the joint types. Thirdly, bending tests were applied on these 72 specimens to obtain the bending slip characteristics and rotational stiffness of these timber joints. Statistical approach was employed to analyze the data and propose models to estimate the bending slip characteristics and initial rotational stiffness for each joint type. The results showed that the bending slip characteristics could be estimated by using slip due to rigid body motion; whereas dimensions and material properties of timber joints can help to predict initial rotational stiffness. Lastly, from the discussion previously, a reliable procedure for evaluation of rotational stiffness of beam-to-column timber joints was proposed.

Keywords: Chuan-Dou timber structures, historic timber structures, timber joints, semi-rigid behavior

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台灣傳統穿闊式木構架接點旋轉強度評估方法之建立

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摘　要

木接點往往是整個木構造中最重要，且對結構行為影響最大的部分。本文旨在提出評估台灣傳統建築中木接點的旋轉強度的流程。首先，經由五棟解體案例可以發現，傳統穿闊式木構架接點中，柱梁接點大致可以分為連續型、斷開對接與燕尾榫搭接等三種。經過田野調查後，本文總共設計兩類實驗，包括應力波非破壞檢測來研判接點形式及接點的足尺彎曲實驗。在經過分析後建立未來評估穿闊式木構架接點旋轉強度的預測方式。未來可以先利用應力波之波速及震幅傳遞率來研判接點種類；接著再分別由本文所提出的三個經驗公式來預測穿闊式木構架接點的旋轉強度。

關鍵詞：穿闊式木構架、木接點、半剛性行為

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